

**REMARKS**

Claims 22-36 are pending in this application. By this Amendment, claims 24, 26, 31 and 33 are amended for clarity. Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached page is captioned "Version With Markings To Show Changes Made."

Entry of this Amendment is proper under 37 C.F.R. §1.116 because the Amendment: a) places the application in condition for allowance; b) does not raise any new issues that require further search and/or consideration; and c) places the application in better form for an appeal should an appeal be necessary. More particularly, the above amendments are in direct response to the rejection first made in the final rejection. While the claims are believed to be definite to one skilled in the art, the claims have been amended to further prosecution. The amendments are minor and therefore do not require any further search and/or consideration. Entry is proper under 37 C.F.R. §1.116.

The Office Action rejects claims 24-26 and 31-35 under 35 U.S.C. § 112, second paragraph. By this amendment, claims 24, 26, 31 and 33 are amended to obviate the grounds for rejection. The above amendments clarify the original claim language. More specifically, claims 24 and 31 generally relate to an adhesion strength between an organic film (such as a polyimide film) and a resin body (such as epoxy resin) used in a sealing body of a package. For example, this adhesion strength is greater than an adhesion strength between an inorganic film (such as a silicon oxide film or the like) and a resin body (such as the above-mentioned epoxy

resin). Further, claims 26 and 33 generally relate to an adhesion strength between a silicon chip and a resin body (such as an epoxy resin used in a sealing body of a package). For example, this adhesion strength is greater than an adhesion strength between a die pad (made of metal such as Cu or the like) and a resin body (such as the above-mentioned epoxy resin). One skilled in the art would understand how an adhesive strength between two materials is greater than an adhesive strength between other materials. The claims also specifically recite the different materials, films, body and pad. Each of these claims is definite. Withdrawal of the rejection under 35 U.S.C. § 112, second paragraph, is respectfully requested.

The Office Action rejects claims 22-36 under 35 U.S.C. § 103(a) over U.S. Patent 5,637,913 to Kajihara et al. (hereafter Kajihara) in view of Japan Kokai 63-271939 to Yamamoto. The rejection is respectfully traversed.

Independent claim 22 recites a semiconductor chip having a main surface and a rear surface opposite to the main surface. The semiconductor chip has a plurality of semiconductor elements and bonding pads formed on the main surface. An organic film is formed to cover the main surface and the organic film has openings exposing the bonding pads.

The Office Action admits that Kajihara does not suggest the claimed organic film. In particular, the Office Action asserts on page 3, line 17 that Kajihara shows an organic film but does not describe an organic film. This statement is contradictory. Kajihara does not teach or suggest an organic film covering the main surface of a chip. The Office Action asserts that one of ordinary skill in the art would consider the

cross hatching portion (see FIG. 30) on the surface of the chip to be an insulative film. However, the Office Action's assertions do not suggest all the claimed features. That is, the Office Action provides no basis or suggestion for the claimed organic film.

The Office Action subsequently concludes (on page 4) that it would have been obvious to one of ordinary skill in the art to use Yamamoto's photosensitive polyimide organic film to modify Kajihara's organic film for the purpose of providing a photolithography process. However, this basis for the alleged combination assumes that Kajihara discloses the claimed organic film. As discussed above, Kajihara does not teach or suggest the claimed organic film covering the main surface of a chip. Therefore, the Office Action's suggestion for this combination is improper and is incorrect. The Office Action therefore fails to make a prima facie case of obviousness. The rejection should be withdrawn at least for this reason.

As discussed in the present application, embodiments of the present invention may provide (in a resin-sealed semiconductor package) an organic film that is selected as an insulating film (passivation) covering the surface of the chip when using a die pad smaller in size than the chip. While use of a die pad smaller in size than the chip can reduce an area of the joint between a resin (die pad and sealing resin) and metal that is comparatively weak in a close adhesion strength, the use thereof increases an area of the joint between a resin (chip and sealing resin) and silicon that is comparatively strong in a close adhesion strength. Thus, it is possible to strengthen an adhesive structure of a rear surface portion of the chip and, for example, to prevent cracks caused due to reflow.

When using a die pad smaller in size than a chip, it has been determined that problems arise using an inorganic film, such as a silicon oxide film, a silicon nitride film or the like on the insulating film on the surface of the chip. The close adhesion strength generated between the inorganic film of the surface of the chip and the sealing resin is relatively weaker than the close adhesion strength generated between the rear surface (silicon) of the chip and the sealing resin. Therefore, stress occurs in a side surface of the chip. Thus, problems occur such as undesirable peeling of the chip and the sealing resin, cracks of the chip, and the like.

The present inventors have recognized these problems, and have made an organic film selected as an insulating film (passivation) covering the surface of the chip when using a small die pad. By using the organic film as the insulating film (passivation) covering the surface of the chip, the balance between the chip and the sealing resin in both an upper surface side and a lower surface side of the chip can be kept relative to a close adhesion strength. As such, a resin sealing type package is provided that has high reliability and in which cracks of the resin, peeling of the resin and the chip, and cracks of the chip may be prevented.

At best, Kajihara's film covering the main surface of a chip is an insulating film (passivation). The insulating film used as the film covering the main surface of the chip may be composed of various kinds of films such as a silicon oxide film, a silicon nitride film, an organic film like a polyimide film (such as that disclosed in Yamamoto) and the like.

However, there is no basis to interpret Kajihara's insulating film as being the

same as Yamamoto's polyimide film. Further, the inventors have made a discovery of a problem (relating to inorganic films) that is not recognized by Kajihara and Yamamoto. Without recognition of this problem, there is no basis to combine Kajihara and Yamamoto as suggested in the Office Action.

Therefore, the combination of Kajihara and Yamamoto is without any basis. Rather, the Office Action combines these references based on impermissible hindsight from reading the present specification.

As such, independent claim 22 defines patentable subject matter. Independent claim 29 defines patentable subject matter at least for similar reasons as claim 22. Claims 23-28 depend from claim 22 and claims 30-36 depend from claim 29 and therefore also define patentable subject matter. In addition, the dependent claims also recite features which further and independently distinguish over the applied prior art.

Withdrawal of the outstanding rejection under 35 U.S.C. § 103(a) is respectfully requested.

### **CONCLUSION**

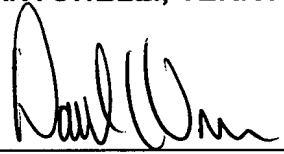
In view of the foregoing, it is respectfully submitted that the above identified application is in condition for allowance. Favorable consideration and prompt allowance of claims 22-36 are respectfully requested.

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Serial No.: 09/381,400

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (843.37610X00).

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "David C. Oren", is written over a horizontal line.

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS**

Claims 24, 26, 31 and 33 have been amended as follows:

24. (Amended) A semiconductor device according to claim 23, wherein an adhesion strength between a material of said organic film and a resin material of said resin body is relatively greater than an adhesion strength between a material of said inorganic film and said resin material of said resin body.

26. (Amended) A semiconductor device according to claim 25, wherein said semiconductor chip is a silicon chip and said rear surface of said semiconductor chip is an exposed surface of silicon, and wherein an adhesion strength between said rear surface of said semiconductor chip and said resin material of said resin body is relatively greater than an adhesion strength between a material of said die pad of said lead frame and said resin material of said resin body.

31. (Amended) A semiconductor device according to claim 30, wherein an adhesion strength between a material of said organic film and a resin material of said resin body is relatively greater than an adhesion strength between a material of said inorganic film and said resin material of said resin body.

33. (Amended) A semiconductor device according to claim 32, wherein said semiconductor chip is a silicon chip and said rear surface of said semiconductor chip is an exposed surface of silicon, and wherein an adhesion strength between said rear surface of said semiconductor chip and said resin material of said resin body is relatively greater than an adhesion strength between a material of said die pad of said lead frame and said resin material of said resin body.